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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/680,158	10/08/2003	Chandra Mouli	M4065.0985/P985	5806

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EXAMINER

WEISS, HOWARD

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 01/04/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

5/L

Office Action Summary	Application No.		Applicant(s)	
	10/680,158		MOULI, CHANDRA	
	Examiner		Art Unit	
	Howard Weiss		2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 November 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-67 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-67 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) ☒ Notice of References Cited (PTO-892) | 4) ☐ Interview Summary (PTO-413) |
| 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) ☐ Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) ☐ Other: _____ |

Attorney's Docket Number: M4065.0985/P985

Filing Date: 10/8/03

Continuing Data: RCE established 11/04/05

Claimed Foreign Priority Date: none

Applicant(s): Mouli

Examiner: Howard Weiss

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/04/05 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1 to 7, 11, 12, 17 to 21, 23, 24, 28 to 34, 37, 41 to 46, 47 to 53, 56, 57 and 62 to 67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohsawa et al. (IEEE 2002), Pham et al. (U.S. Patent No. 6,838,322) and Kencke et al. (U.S. Patent No. 6,313,486).

Ohsawa et al. show most aspects of the instant invention (e.g. Figures 1 to 3) including:

- an SOI substrate with two layer of opposite conductivity type (i.e. P and N)

- a partially depleted storage transistor located on said substrate's surface (e.g. Figures 1)
- first and second source/drain regions **n** with a body portion **p** there between
- a gate structure consisting of a gate electrode and insulating layer of silicon oxide
- a word line **WL** connected to said gate structure and a bit line **BL** connected to one of said source/drain regions

Ohsawa et al. do not show the storage transistor as a FinFET with the gate structure wrap around the body portion in at least two planes and consisting of a plurality of gates, the gate electrode comprising doped polysilicon or metal, the thickness of the insulating layer being thicker on the top of the body portion than on the sides, the source/drain regions being raised and consisting of layers of $\text{Si}_x\text{Ge}_{1-x}$ and $\text{Si}_y\text{Ge}_{1-y}$ with different band gaps and values of x and y and capable of generating carriers through impact ionization.

Pham et al. teach (e.g. Figure 9) to form FETs as FinFETs with the gate structure wrap **24** around the body portion **20** in at least two planes and consisting of a plurality of gates (Column 2 Lines 33 to 35), the gate electrode comprising doped polysilicon or metal (Column 5 Line 66 to Column 6 Line 3), the thickness of the insulating layer being thicker on the top **22** of the body portion than on the sides, the source/drain regions **33** being raised and consisting of layers of materials **32**, **34** with different band gaps (e.g. Figure 5) to obtain suitable threshold voltages for high-speed logic devices while controlling extrinsic resistance (Column 1 Lines 51 to 60). It would have been obvious to a person of ordinary skill in the art at the time of invention to form FETs as FinFETs with the gate structure wrap around the body portion in at least two planes and consisting of a plurality of gates, the gate electrode comprising doped polysilicon or metal, the thickness of the insulating layer being thicker on the top of the body portion than on the sides, the source/drain regions being raised and consisting of layers of materials with different band gaps as taught

by Pham et al. in the device of Ohsawa et al. to obtain suitable threshold voltages for high-speed logic devices while controlling extrinsic resistance.

Kencke et al. teach (e.g. Figure 2) to have source/drain regions **12/14** consisting of layers of $\text{Si}_x\text{Ge}_{1-x}$ and $\text{Si}_y\text{Ge}_{1-y}$ **24,26** with different band gaps and values of x and y and capable of generating carriers through impact ionization (Column 2 Lines 45 to 61) to provide better device characteristics (Column 4 Lines 1 to 5). It would have been obvious to a person of ordinary skill in the art at the time of invention to have source/drain regions consisting of layers of $\text{Si}_x\text{Ge}_{1-x}$ and $\text{Si}_y\text{Ge}_{1-y}$ with different band gaps and values of x and y and capable of generating carriers through impact ionization as taught by Kencke et al. in the device of Ohsawa et al. to provide better device characteristics.

Since the Applicant has not established the criticality of the doses stated and since these doses are in common use in similar devices in the art, it would have been obvious to one of ordinary skill in the art to use these values in the device of Ohsawa et al., Pham et al. and Kencke et al. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

4. Claims 8 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohsawa et al., Pham et al. and Kencke et al., as applied to Claim 1 above, and further in view of Hu et al. (U.S. Patent No. 5,448,513).

Ohsawa et al., Pham et al. and Kencke et al. show most aspects of the instant invention (Paragraph 3) except for the heavily doped region of a second conductivity adjacent to one of the source/drain regions and separated from the other source/drain region. Hu et al. teach (Figure 1A) to have a heavily doped region **16** of a second conductivity adjacent to one of the source/drain regions **12** and separated

form the other source/drain region **14** to use less voltage during write operations (Column 4 Lines 50 to 53). It would have been obvious to a person of ordinary skill in the art at the time of invention to have a heavily doped region of a second conductivity adjacent to one of the source/drain regions and separated from the other source/drain region as taught by Hu et al. in the device of Ohsawa et al., Pham et al. and Kencke et al. to use less voltage during write operations.

5. Claims 14 to 16, 38 to 40 and 59 to 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohsawa et al., Pham et al. and Kencke et al., as applied to Claim 1 above, and further in view of Matsumoto et al. (U.S. Patent No. 6,806,537).

Ohsawa et al., Pham et al. and Kencke et al. show most aspects of the instant invention (Paragraph 3) except for the source/drain regions having a silicide in contact therewith, the silicide different for the source/drain regions. Matsumoto et al. teach (Figure 25) to silicide **45** contacts to source/drain regions **10** to reduce the gain of any parasitic bipolar transistors (Column 17 Lines 56 to 60). It would have been obvious to a person of ordinary skill in the art at the time of invention to silicide contacts to source/drain regions as taught by Hu et al. in the device of Ohsawa et al., Pham et al. and Kencke et al. to reduce the gain of any parasitic bipolar transistors.

In reference to the silicide and concentrations of the sources/drain regions, it would have been obvious to one having ordinary skill in the art at the time the invention was made to make the silicide contacts and dopant concentrations different, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

6. Claims 15 and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohsawa et al., Pham et al. and Kencke et al., as applied to Claim 1 above, and further in view of Takasu (U.S. Patent No. 5,307,305).

Ohsawa et al., Pham et al. and Kencke et al. show most aspects of the instant invention (Paragraph 3) except for the insulating material having a high dielectric constant. Takasu teaches (Figure 1) to use insulating material **15** having a high dielectric constant to obtain good FET characteristics (Column 17 Lines 56 to 60). It would have been obvious to a person of ordinary skill in the art at the time of invention to use insulating material having a high dielectric constant as taught by Takasu in the device of Ohsawa et al., Pham et al. and Kencke et al. to obtain good FET characteristics.

7. Claims 9, 10, 27, 36, 54 and 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohsawa et al., Pham et al. and Kencke et al., as applied to Claim 1 above, and further in view of Yu et al. (U.S. Patent No. 6,221,724).

Ohsawa et al., Pham et al. and Kencke et al. show most aspects of the instant invention (Paragraph 3) except for the body portion containing an inert dopant. Yu et al. teach (Figure 1) to use an inert dopant **46** in a body portion **12** to suppress punch-through (Column 2 Lines 1 and 2). It would have been obvious to a person of ordinary skill in the art at the time of invention to use an inert dopant in a body portion as taught by Yu et al. in the device of Ohsawa et al., Pham et al. and Kencke et al. to suppress punch-through.

Since the Applicant has not established the criticality of the doses stated and since these doses are in common use in similar devices in the art, it would have been obvious to one of ordinary skill in the art to use these values in the device of Ohsawa et al., Pham et al. and Kencke et al. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the

applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Response to Arguments

8. Applicant's arguments with respect to Claims 1 to 67 have been considered but are moot in view of the new ground(s) of rejection. The Examiner's response in the previous office action is still valid and considered repeated here. Additionally, in response to applicant's argument that there is no suggestion in the prior art to use a FinFET as storage device, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). As detailed in the rejections above, one of ordinary skill would combine the prior art for those reasons stated to produce the instant invention.

In view of these reasons and those set forth in the present office action, the rejections of the stated claims stand.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Huang et al. (U.S. Patent No. 6,924,181) teach the use of multilayered source/drain regions.
10. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should

Art Unit: 2814

you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at **866-217-9197** (toll-free).

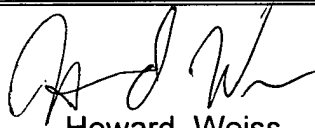
11. Papers related to this application may be submitted directly to Art Unit 2814 by facsimile transmission. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2814 Fax Center number is **(571) 272-8300**. The Art Unit 2814 Fax Center is to be used only for papers related to Art Unit 2814 applications.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Howard Weiss at **(571) 272-1720** and between the hours of 7:00 AM to 3:00 PM (Eastern Standard Time) Monday through Friday or by e-mail via **Howard.Weiss@uspto.gov**.

13. The following list is the Examiner's field of search for the present Office Action:

Field of Search	Date
U.S. Class / Subclass(es): 257/347	thru 12/28/05
Other Documentation: none	
Electronic Database(s): EAST	thru 12/28/05

HW/hw
28 December 2005


Howard Weiss
Primary Examiner
Art Unit 2814